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Religion and Demography: Papal Influences on Fertility

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Abstract

How do social norms affect fertility? Examining the visits of Pope John Paul II to 13 Latin American countries, which reinforced Catholic Church teachings, we find positive long term effects on fertility. These are driven by first births and by those residing in a region that the Pope visited. Papal messaging matters: fertility increases more when the Pope mentions marriage or abortions and contraception, and decreases with condemnations of pre-marital sex. Marriages increase with all three messages. Further, the effects are strongest for those who are less likely to be following Church teachings, such as non-Catholic, wealthier, and educated households.

JEL codes: J13, Z12, D83, N36, J12

Keywords: social norms, religion, fertility, messaging, Latin America, contraception, marriage

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1. Introduction

Nearly every country in the world has undergone a demographic transition: fertility has fallen globally since 1950, with all but six countries projected to fall below replacement rates by the end of the century (Delventhal et al., 2021; GBD 2021 Fertility and Forecasting Collaborators, 2024).[1] Since Becker (1960), economists have explained fertility differences as arising from substitution and income effects (Black et al., 2013; Schaller, 2016) or the quantity-quality tradeoff (Aaronson et al., 2014; Bleakley & Lange, 2009). However, these economic determinants do not fully account for fertility behavior, with recent work stressing the role of other factors such as culture and social norms (Doepke et al., 2022).

This paper studies how fertility responds to an increase in the salience of social norms. We do this by examining the impact of 16 Papal visits by Pope John Paul II across 13 Latin American countries over the period 1979-1996. The Papal visits were major events in these countries, with the Pope's public prayers and speeches attended by millions of people across the continent. The Catholic church has explicit views on fertility-related behavior: abortion and (artificial) means of contraception are proscribed, premarital sex is considered a sin, and marriage and procreation within marriage are strongly encouraged. Several Popes, including Pope John Paul II, have publicly reaffirmed these teachings. Thus, these visits, while not directly aimed at influencing fertility, likely heightened existing Catholic norms. The effects of reinforcing Catholic church teachings on observed fertility are ex-ante ambiguous, since reductions in premarital sex would reduce fertility, while reductions in contraception or abortion would increase it.

We use Demographic and Health Survey (DHS) data on retrospective fertility histories to examine whether there are significant increases in fertility after a Papal visit. Specifically, we create a woman-month panel in a balanced window around each visit. To capture the immediate effect of the visit, we estimate whether the probability of conceptions is higher in the month of the visit compared to what it would have been in the absence of the visit, controlling for the usual pattern of seasonality in conceptions as well as year and individual fixed effects. To estimate the long term effects, we compare whether the probability of conceptions is higher in the months

[1] The demographic decline has stark implications for macroeconomic outcomes such as economic growth, entrepreneurship, and firm dynamics (Becker, Murphy & Tamura, 1990; Galor & Weil, 2000; Hopenhayn et al., 2022; Jones, 2022; Karahan et al., 2024).

following the visit compared to before, controlling for individual fixed effects, within-year seasonality, age and age squared, and secular time trends.

We find a significant and large increase in fertility in the 2-5 years after the Papal visit for all but one of the visits in our database. The effect sizes vary from 11% of the mean in Nicaragua to 65% of the mean in El Salvador. Using simple back of the envelope calculations, we find that this translates to between 220,000 and 251,000 additional births (0.3 - 0.4% increase) in the years after the Papal visit. There is no significant *immediate* increase in the probability of conception i.e. during the month of the Papal visit. We verify that the fertility effects are larger among those who were more likely to be exposed to the Papal messages, proxied by residence in the subnational region actually visited by the Pope.

We then examine whether the specific messages of the Pope matter, by compiling data on the content of the Pope's speeches from the Vatican's archives. We focus on words or phrases related to Church teachings that would directly impact fertility decisions, namely marriages, pre-marital sex, contraception, and abortions.

We find that the messages do in fact matter. Greater mentions of marriage result in greater fertility increases: a doubled emphasis on marriage leads to a 0.47 percentage point increase in the probability of conception and a 0.27 percentage point increase in the probability of a (first) marriage. In contrast, mentions of pre-marital sex (disapproved by the Church) increase the probability of marriage and reduce the probability of conceptions after the visit. Further, a doubled emphasis on abortion or contraception results in 0.11 percentage point increase in long term conception probability and a 0.2 percentage point increase in marriage.

Examining who responds to the visits, we first establish that the increases are driven by first births, i.e., the extensive margin of fertility choice, with weaker effects for higher order births. Consistent with a model of social norms where individuals face costs from deviating from culturally prescribed behavior (Akerlof, 1997; Spolaore & Wacziarg, 2022), we find that the effects of increasing the salience of Catholic social norms are strongest for women who are less likely to be adhering to Catholic Church teachings on fertility control at the time of the visit. Fertility increases are larger for those who are wealthier and more educated (who we verify are also more likely to be using contraception in the data), as well as those who do not identify as Catholic (and for countries with lower levels of Catholicism) prior to the visit. Further, the effects

are strongest for countries that secularized more recently, which we define as the country declaring the freedom of religion in their constitution.

We provide several robustness checks to rule out other mechanisms or confounders that may be influencing the results. We demonstrate that explicit goal of the visit was not directly related to fertility behavior, that fertility was not trending in any direction in the months leading into the visit, and that our results are robust to controlling for whether there was an ongoing conflict, which was an explicit purpose of some visits and may also affect fertility (Bove et al. 2024).

Our results tie together two streams of literature. First, we contribute to the literature on the determinants of fertility choices. Previous work has focused on the traditional Beckerian economic drivers of fertility, such as labor market returns or opportunity costs (Ager et al., 2020; Jensen, 2012; Berman et al., 2018; Hungerman, 2014b; Kearney & Wilson, 2018; Kitchens & Rodgers, 2020; Lam & Duryea 1999; Moorthy, 2024; Schultz, 1985; Zipfel, 2024) and the returns to education (Becker & Lewis 1973; Galor, 2012; Okoye & Pongou, 2024), as well as more proximate causes such as access to contraceptives (Ashraf et al., 2014; Bailey, 2006; Bhattacharya & Chakraborty, 2017; Buckles & Hungerman, 2018; Dupas et al., 2024). A more recent literature has emphasized the role of social norms and religion on fertility in both historical settings (Beach & Hanlon, 2023; Blanc, 2024; Spolaore & Wacziarg, 2021) and in modern developing countries (Guirkinger & Villar, 2022; Munshi & Myaux, 2006; Godlonton & Theoharides, 2022).[2]

Despite the growing attention to the role of religion and social norms in shaping fertility, little is known about the effects of religious leaders in shaping such norms and associated behavior.[3] Bassi and Rasul (2017) and Farina and Pathania (2020) examine the role of Papal visits on fertility in Brazil and Italy, respectively, finding contrasting results. Bassi and Rasul (2017) document a short-term increase in fertility resulting from a decline in contraception, while Farina and Pathania (2020) find a decline in abortion with no increase in fertility, suggesting an increased probability of contraception. Chung et al. (2024) document fertility increases in Georgia stemming from the church Patriarch's promise to personally baptize third and higher-order children. Our

[2] A broader literature discusses the role of social identity on individual economic choices, and the effect of making group identity salient (Akerlof & Kranton, 2000; Benjamin et al., 2016; Chen & Chen, 2011; Hungerman, 2014a).
[3] Two recent papers focus on the identity of political leaders. Bhalotra et al. (2021) find that the presence of Muslim legislators reduces abortion and increases fertility in India, attributing this to the known anti-abortion preferences of Muslims. Dahl et al. (2022) show that economic optimism led to higher fertility in Republican relative to Democratic districts following the election of Donald Trump.

study differs from these previous ones by examining the differential impact of the same leader across different settings, analyzing how the impact varies by the explicit content of the leader's messages and showing that the reinforcement of religious norms by religious leaders can influence fertility behavior even among those not prescribing to the particular religion.

Second, we contribute to the literature on the effects of messaging and persuasion on economic behavior. DellaVigna and Gentzkow (2010) review the literature on persuading voters, donors, and investors, while other reviews discuss the wider impact of mass media (DellaVigna & La Ferrara, 2015; La Ferrara, 2016). Most relevant to our work is the literature studying how media representations can influence fertility decisions (Jensen & Oster, 2009; Kearney & Levine, 2015; La Ferrara et al., 2012), and how the provision of information can change contraception or fertility (Ashraf et al., 2022; Glennerster et al., 2022; Miller et al., 2020). We contribute to this literature by focusing on the understudied role of religious persuasion on demographic behavior, and by examining the effect of specific messages rather than broad measures of access to information.

The rest of the paper is structured as follows: Section 2 provides background information on religion and fertility in Latin America and Section 3 describes our data sources. Section 4 describes our results and Section 5 concludes.

2. **Religion and Fertility in Latin America**

2.1. Catholicism in Latin America

Since the Spanish and Portuguese colonization, Latin America has been majority Catholic. Even after successful independence movements in the mid-1800s, most Latin American countries signed formal *concordat* agreements to retain the official patronage of the Catholic Church. Approximately 80% of the Latin American population was baptized Catholic in 2020, a decline from 92% in 1970 (Zurlo & Johnson, 2024). Despite the lengthy presence of the Church in the region, the first Papal visit to the South American continent took place only in 1968 when Paul VI visited Colombia. During his papacy from 1978 to 2005, Pope John Paul II made 118 trips to 102 different countries, visiting more countries than all previous Popes combined. These visits served as a major vehicle for promoting Vatican diplomacy and re-establishing the Papacy (the "Holy See") as a key player on the international stage (Barbato, 2013). 18 of these trips were to Latin America which he called "the continent of hope," visiting almost every country in the region.

A Papal visit usually begins with invitations from the bishops' conferences and the country's government, often aiming to address pertinent issues where the church's involvement could have a positive influence. For example, the visit to Colombia in 1986 was focused on the country's recovery from the "Armero tragedy," a volcanic eruption that resulted in several thousand deaths, and to promote peace in the country's ongoing internal conflict with guerilla groups. Papal visits are planned and announced months in advance, to give host countries time to prepare and in some cases, build new infrastructure to accommodate the Pope's public appearances. Papal visits are well-publicized events and extremely well-attended. For example, the Pope's public mass in Trinidad and Tobago was attended by an estimated 35,000 people, and the Pope's speech upon arrival to Paraguay was attended by about 500,000 people, approximately $1/8^{th}$ of the country's population (Butturini, 1985; Drosdoff, 1988).

Pope John Paul II was a well-known advocate for traditional Catholic teachings on family planning, which permit only timed abstinence as an acceptable method of birth control. Similar to many previous Popes, he frequently preached against premarital sex, contraception, and abortion. In his 1981 encyclical *Familiaris Consortio* he described modern contraception as a way to "degrade human sexuality." During his visit to Paraguay, he stressed the avoidance of premarital sex, and in his speech in Trinidad and Tobago, he condemned "the unspeakable crime of abortion" (see Appendix C for detailed quotes).

While the Pope did promote such restrictions on fertility behavior during his visits to Latin America, such messaging was not the main or explicit purpose of the visit. In Appendix Figure A.2, we conduct a content analysis to visualize the distribution of the 100 most frequent words across the Spanish speeches, where the size of the words is proportional to their frequency. Fertility related messaging such as mentions of abortions or pre-marital sex are not very prominent, with most of the speeches and prayers featuring Catholic related terms more generally, such as "faith," "church," and "Jesus." We discuss the frequencies of fertility related terms further in Section 3.2.

2.2. Possible Effects of Papal Visits on Fertility

Latin America has experienced a dramatic decline in fertility, from an average of 5.9 births per woman in 1960 to 2.2 in 2010. For comparison, the corresponding figures for the United States were 3.6 and 1.9, respectively. Abortion in Latin America remains either illegal or severely restricted, with only a few countries having recently legalized it. The region's history of opposing

sex education and the use of modern contraception directly correlates with the influence of the Catholic Church in Latin American society.

Since Papal visits emphasize Catholic Church teachings, there can be several possible changes in fertility-related behaviors if individuals are persuaded by these messages. First, a reduction in pre-marital sexual relationships would result in a decline in out-of-wedlock births. Second, individuals may be incentivized to marry rather than continue "living in sin," potentially resulting in higher (within-marriage) birth rates. Third, contraceptive usage and abortion rates could decrease, in both married and unmarried couples, thereby increasing birth rates. Alternatively, there could be no change in births if aversion to abortion rises high enough that women increase contraception or abstinence to avoid the possibility of an abortion decision. Fourth, factors unrelated to the actual messages may be relevant, such as individuals devoting greater time towards traveling to Papal visit venues, listening to the Pope's speeches, attending church, or engaging in other activities such as charity ventures. These alternative uses of time may result in a decline in sexual activity and therefore birth rates, particularly in the month of the visit. Finally, increased optimism generated by the Pope's visit may increase fertility in the long run (Dahl et al., 2022; Ivanova and Balbo, 2024).

The net effect of the Pope's visit on observed fertility is therefore ambiguous ex-ante. In our analysis, we will examine marriage decisions and out-of-wedlock conceptions as additional outcomes in order to shed light on possible mechanisms. Administrative data on abortion are not available, and survey responses may not be reliable since abortion was illegal in all Latin American countries during the period of our analysis. The surveys we use only ask about contraceptive usage at the time of the survey, and do not provide a time series on this.

There is also likely heterogeneity in who is more likely to respond to the papal visit. In Appendix B, we provide a simple model of social influence based on Spolaore and Wacziarg (2022) and Akerlof (1997) in which the salience of social norms influences fertility behavior. The key implication of the model is that when the cost of deviating from societal norms is increased (say, by the Pope's visit making them more salient), women who are less likely to be adhering to Church teachings at the time of the visit are those whose behavior will respond more strongly to an increase in the salience of social norms. In other words, women who deviate from Church teaching face larger utility costs if the social or moral stigma associated with fertility control become more salient following a papal visit, whereas women who are already adhering to Catholic

proscriptions would not be as influenced to alter their fertility behavior. Thus, we may expect to see fertility increase more for those who were more likely to be practicing some form of modern birth control, or those who do not identify themselves as Catholic.

It is also ambiguous as to when we might expect to see the effect of a Papal visit on fertility decisions. We may see an increase in births within a couple of months after the visit, if the main mechanism is reduced abortion for conceptions that began prior to the Pope's arrival. If, instead, the main margin of behavior change is lowered contraception use, we would expect to see a rise in births over a longer time frame i.e. at least 8-9 months after the Pope's visit or even later. If the visit results in changing attitudes towards higher marriage and more fertility within marriage, we would expect positive fertility effects over a longer time frame as well. Finally, since the Pope's visit is announced several months prior, the Catholic church's teachings may be amplified by bishops or pastors even prior to the actual visit (or people may be more receptive in anticipation of the visit). In our data analysis, therefore, we examine both short-term and long-term effects, and we also consider the possibility of anticipatory effects prior to the arrival of the Pope.

3. Data Sources and Empirical Strategy

3.1. Data on Fertility

We use data from the Demographic and Health Surveys (DHS), which are nationally representative household surveys funded by the U.S. Agency for International Development (USAID) and conducted in over 90 countries since the mid-1980s. These surveys collect detailed information from women of child-bearing age about their fertility histories, including a retrospective questionnaire on the month and year of all births. These fertility histories enable us to construct fertility time series for each woman using a consistent survey methodology and questionnaire across countries. As mentioned earlier, the surveys we use only ask about contraceptive usage at the time of the survey.

We focus on Latin America as the region with the highest proportion of Catholics worldwide, where we might expect Papal presence and messages to have the largest impact. We identify 13 countries that were visited by Pope John Paul II, which also have DHS surveys conducted after the Pope's visit: Bolivia, Brazil, Colombia, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Mexico, Nicaragua, Paraguay, Peru, and Trinidad & Tobago. Three of these countries were visited twice by the Pope, resulting in 16 country-visit samples. Table 1

shows the dates of Papal visits and the dates of the DHS surveys we use. Several Papal visits to Latin America are excluded from our analysis, as they were not followed by a DHS survey.[4]

The countries included in our analysis vary considerably across many dimensions, including education and economic status. For instance, less than 10% of Nicaragua's population had a car at the time of the Pope's visit, compared to 26% in Brazil and 54% in Trinidad and Tobago (Appendix Table A.2). Some countries secularized as early as 1857 (Mexico), while others like Bolivia retained Catholicism as the official state religion until 2009.[5]

3.2. Data on Papal Visits and Messages

The website of the Vatican provides the dates of Papal visits and the full content of every speech delivered by Pope John Paul II, in Spanish, Italian, and English if this was the language spoken in the country. The length of these visits varied across countries. For instance, the Pope spoke more than 56,000 words in 36 speeches during his visit to Colombia in 1986, compared to less than 3,000 words in three speeches during the visit to Trinidad & Tobago in 1985. We searched the content of these speeches for several keywords related to the potential mechanisms discussed in Section 2.2 (premarital sex, marriage, abortion, contraception). The frequency of these terms varied considerably across different visits. Abortion, contraception or sterilization were explicitly mentioned in six visits (Table 1, column 7), marriage was mentioned in 11 countries (column 8), and pre-marital sex in five (column 9), all with differing per-speech intensities. The Pope's speeches also cover topics such as divorce, children, family, faith, poverty, and education (Appendix Table A.1).

3.3. Outcomes

Our main fertility outcome is a dummy for whether the woman conceives in a specific month. We compute the date of conception as nine months prior to the month and year of birth recorded in the DHS. Note that there could be measurement error in this dependent variable if respondents do not

[4] The visits excluded from the analysis are the visits to Argentina (1982 and 1987), Brazil (1997), Chile (1987), Costa Rica (1983), Mexico (1990, 1993, 1999), Uruguay (1987 and 1988), and Venezuela (1985 and 1996). These countries either conducted their own national surveys or had set up detailed administrative data systems to track demographic and health outcomes. Such administrative data may not be available in comparable formats across countries, unlike the standardized questionnaires and methodology of the DHS.

[5] Secularization has been posited as a driving force behind the demographic transition in some historical contexts (Blanc, 2024). Here, secularization is defined by a country declaring freedom of religion in the constitution. We obtained dates of secularization by looking into constitutional changes in the 13 countries included in our analysis.

recall the birth month accurately, if the birth was premature, or if the pregnancy extended significantly beyond the usual length. We are also not able to track conceptions that ended prior to birth, e.g., through abortion or miscarriage. The average probability of conception in a given month varies considerably across countries, from 0.85 percent in Trinidad and Tobago to 2.07 percent in Guatemala (Appendix Table A.2).

Since the Pope's messages can cause behavior change along several dimensions, we also analyze marriage and premarital sex as supplementary outcomes. The DHS only records the date of first marriage, so that we are able to examine whether Papal messages result in higher rates of first marriage. Our proxy for premarital sex is the occurrence of an out-of-wedlock conception, defined as a conception prior to the date of first marriage.[6] Note that out-of-wedlock births account for only 1-8% of all conceptions in our data (Appendix Table A.2).

We retain observations in a balanced time window around the Pope's visit, using the gap between the DHS survey date and the Papal visit date as the window length. For instance, when we use Colombia's 1990 DHS to examine the effect of the July 1986 Papal visit, we retain months from July 1982 through July 1990. We create a balanced woman-month panel around the Pope's visit. We drop the nine months following a conception, since the risk of further conception is zero, and we drop sterilized women from the month they report being sterilized. Note that the woman-month panel when using marriage as an outcome is not a one-to-one correspondence with the woman-month conception panel, since the DHS only records the date of first marriage. For conceptions, women re-enter the panel following a birth due to the possibility of a subsequent birth. For marriages, women exit the panel following their first marriage.

3.4. Linear Probability Model (LPM)

To examine the immediate effect of the visit on the probability of conception, we estimate the following linear probability model (LPM) separately for each visit:

$$(1) \qquad Conceive_{imy} = \alpha_i + \tau_m + \delta_y + \beta_{lmm} Visit\_Month_{my} + \boldsymbol{X_{imy}}'\gamma + e_{imy}$$

[6] Since the DHS does not record dates of second or subsequent marriages, it is possible that we underestimate the rate of overall marriage and out-of-wedlock conceptions, such as those that occur after the dissolution of a first marriage. This is unlikely to be very high since only 3.4% of respondents are divorced or widowed at the time of the surveys.

In equation (1), $Conceive_{imy}$ is a dummy that equals one if woman i conceived in month m of year y. $Visit\_Month_{my}$ is our main variable of interest, defined as a dummy that equals one for the month and year in which the Pope visited. α_i, τ_m, and δ_y represent fixed effects for each woman, month, and year respectively.[7] These capture the effects of any time-invariant characteristics of the woman (such as education, religion, or rural residence), seasonal effects on conception, and any countrywide factors that affect all women in that year. $\boldsymbol{X_{imy}}$ is a vector of time- and woman-varying controls such as age and age-squared. β_{lmm} is the coefficient of interest, which captures whether the probability of conception is significantly different in the month of the Pope's visit, compared to the same month in other years. Standard errors are clustered for each woman i to account for serially correlated shocks for each individual.

Some of the possible effects of the Pope's visit may vary across short versus long time frames. For instance, temporary distractions or travel during the month of the Pope's visit may result in lower fertility in that month, but this may reverse in the longer term as this disruption ceases. Conversely, if temporary religious fervor leads to greater compliance with the non-contraception stance of the Catholic church, this may dissipate in the longer term. In order to capture these longer run effects or any possible retiming of fertility, we amend (1) as follows:

$$(2) \qquad Conceive_{imy} = \alpha_i + \tau_m + \theta(y\text{-}1980) + \beta_{LR} Post\_Visit_{my} + \boldsymbol{X_{imy}}'\gamma + e_{imy}$$

where $Post\_Visit_{my}$ is an indicator equal to one for all months following the visit, excluding the actual visit month. Equation (2) estimates whether women systematically increase or decrease fertility after the visit compared to before, controlling for age and age-squared, seasonality (via month fixed effects τ_m), and time trends.[8] Comparing estimates from (1) and (2) would capture any retiming of fertility in response to Papal visits. For example, if women have children earlier than they would have absent the visit, but do not increase their overall level of fertility, then we would see a positive coefficient for the immediate effect, followed by a negative coefficient for the long term coefficient. We also run an "event-study" specification where we replace the $Post\_Visit_{my}$ dummy with a vector of indicators for 10 months prior and 10 months following the

[7] We also use a discrete proportional hazard model to estimate the short term results. See Appendix D for details.
[8] Since $Post\_Visit_{my}$ is collinear with year fixed effects, we instead control for a linear time trend.

visit. This allows us to examine if there were any pre-trends in fertility or dynamic effects (e.g. anticipatory effects).

3.5.Mechanisms and Heterogeneous Effects

After examining the immediate and long term fertility responses, we examine heterogeneous effects across different visits, countries, and individuals to shed light on the mechanisms by which the Papal visit may influence fertility. To do so, we pool all of the country level datasets together and run the following interacted regression specification on the pooled data:

$$(3) \qquad Conceive_{icmy} = \alpha_i + \tau_m + \delta_y + \beta_1 PapalVisit_{cmy} + \beta_2 PapalVisit_{cmy} * A_{ic} + \boldsymbol{X_{icmy}}'\gamma + e_{icmy}$$

where $Conceive_{icmy}$ represents the conception dummy for woman i of country c in month m of year y. β_1 represents the impact of the Papal visit on conception for individuals or countries without characteristic A_{ic}, while β_2 represents the additional effect for those with characteristic A_{ic}. A_{ic} could be either binary or continuous. Note that the individual fixed effects subsume country fixed effects and the main effect of $A_{ic.}$ We estimate (3) under two specifications. To capture the immediate effects of the visit, $PapalVisit_{cmy}$ equals the country-specific $Visit\_Month_{my}$ dummy, from (1). To capture the long term effects, $PapalVisit_{cmy}$ equals the country-specific $Post\_Visit_{my}$ dummy, in (2).

4. Fertility Effects of Papal Visits

4.1. Immediate and Long Run Effects on Fertility

We find a negative or null immediate effects but a substantial, positive, and significant long term effect of Papal visits on fertility. Figure 1 shows the estimated β_{Imm} and β_{LR} coefficients from specifications (1) and (2) for each country-visit along with the 95% confidence intervals. Only four countries show a positive, albeit statistically insignificant, effect of Papal visits on conception in that month, while four visits show a statistically significant decline in the probability of conception during the month of the Papal visit: El Salvador (1983), Haiti (1983), Ecuador (1985), and Nicaragua (1996).[9]

[9] Using a discrete proportional hazard model to estimate equation (1) results in coefficients that are highly correlated (0.97) with the LPM estimates presented in Figure 1 (see Appendix D for details).

In contrast to the immediate effects, Figure 1 shows that the long term effects on fertility are positive and statistically significant in 15 out of the 16 country-visits (the exception is Peru 1985). Even the four countries that showed decreases for the immediate effect show positive and significant coefficients for the long term effects, suggesting that the immediate declines in fertility were only temporary. The significant effect sizes range from 0.13 percentage points (Nicaragua 1983) to 0.86 percentage points (El Salvador 1983). We perform a back-of-the-envelope calculation to quantify the magnitude of these estimates. For each country, we take the number of births prior to the visit from the United Nations Population Division database, and multiply these by their respective country specific coefficient to obtain the implied increase in births following the visit.[10] Adding these country specific numbers together implies approximately 251,000 additional births in the years after the Papal visit. This represents a 0.4% increase over the total number of pre-visit births. These long term fertility changes take several years to materialize in some countries. Re-estimating equation (2) using a uniform two-year window for all country-visits, we find that, for Bolivia, Ecuador, El Salvador, Paraguay, and Trinidad and Tobago, the two-year effects capture more than half of the overall post-visit fertility effect, while the two-year effects are much closer to the small or negative immediate effects for the other countries (Appendix Figure A.4).[11]

We now examine whether the fertility effects vary with exposure to the Pope's messages. We construct two proxies of such exposure: whether the household has a radio or TV, and whether the Pope visited the subnational region where the household lives.[12] We pool all the country datasets together and use these proxies as A_{ic} in equation (3). We find that while the Papal visit has a statistically significant 0.04 percentage point increase in the fertility of those who do not live in the subnational regions where the Pope visited, the effect is larger for those that do. In these regions, conception probability rises by 0.11 percentage points in the long term ($\beta_1 + \beta_2$ coefficients from Appendix Table A.3, columns 4).[13] In contrast, the fertility impact does not vary across

[10] We limit the number of years before the visit to the number of years we have in our sample for each country.
[11] While our main estimation uses different time windows for different visits (based on the timing of the DHS surveys), it is not the case that longer time windows automatically result in larger effect sizes: the correlation between the length of the time window and the effect size is -0.47.
[12] The DHS records the *de facto* region of residence where the respondent was interviewed. The level of granularity varied by country, from two regions in Trinidad and Tobago to 17 in Nicaragua. Across all countries, 43% of women lived in a region that contained a city where the Pope visited.
[13] The overall un-interacted effect of the papal visit is a 0.075 percentage point increase in the probability of conception (Table A.3, Column 2).

households that have a TV or a radio and those that do not, with both groups showing significant fertility increases in the longer term (Appendix Table A.3, column 6). The contrast suggests that personal or social factors are more likely to drive the increased salience of norms rather than impersonal messaging.

We examine whether there are any anticipatory effects by estimating a version of equation (1) on the pooled data from all countries where we add a vector of indicators for the 10 months following and preceding the Papal visit. We omit the indicator for 10 months prior, making each estimate a comparison of the probability of conception in a given month relative to that 10 months before the visit.[14] Appendix Figure A.3 shows that there is no systematic trend in the probability of conception before the Papal visit, and the probability of conception begins an increasing trajectory in the months following, becoming statistically significant 6-8 months after the Papal visit.

4.2. Fertility and Exposure to Papal Messaging

We next investigate how the fertility responses change when the Pope speaks about fertility-related topics. We expect Papal mentions of fertility-related topics such marriages, pre-martial sexual relationships, abortions and contraception usage to nudge individual behavior towards the social norms endorsed by the Catholic church i.e. towards more marriage and higher (within-marriage) fertility, lower premarital sex (and hence lower fertility), and lower use of abortion or contraception (and hence higher fertility). We report estimates of equation (3) in Table 2 where we interact the Papal visit indicator with the mentions of each topic per speech. The reported coefficients and standard errors are multiplied by 100, and therefore represent percentage point changes in the probability of conception.

We find that the patterns of fertility change are strongly correlated with the specific content of the Pope's speeches. There is a statistically significant and economically large increase in long term fertility when the Pope explicitly mentions marriage in his speeches (Table 2, column 2); there is no immediate effect, consistent with the idea that marriages may not happen immediately. If the Pope included an additional mention of marriage in every speech, there would be a 0.94 percentage point (β_2 in column 2, t-statistic =18) increase in the probability of conception in the

[14] We group all time periods greater than 10 as one indicator, and do the same for months less than 10.

long term. In contrast, we do not see any such increase in immediate fertility (β_2 = -0.15, t-statistic = -0.63). Note that one additional mention of marriage is equivalent to quadrupling the Pope's emphasis on marriage, since the average of marriage mentions per speech is 0.24 (Table 1). Therefore, doubling the emphasis on marriage would result in long term increases of 0.47 percentage points in the probability of conception (33% of the mean).

We can also directly observe the impact on marital formation: one additional mention of marriage per speech increases the probability of marriage by 0.535 percentage points in the long term (t-statistic = 5.8) but has no significant effect on marriages during the month of the visit (Appendix Table A.4, panel A, columns 1 and 2). Doubling the emphasis on marriage would result in a 0.27 percentage points in the probability of marriage (27% of the mean). Thus, explicit mentions of marriage increase marital formation and fertility in the long run.

We next examine whether there are any changes in premarital sex. If the Pope were to include an additional mention of pre-marital sex in each speech, this would result in a 0.53 percentage point decline in long term fertility (t-statistic = -4.3), suggesting that people engage less in premarital sex (β_2 from Table 2, column 4).[15] Interestingly, this is more likely because people are waiting to get married: we find that each additional Papal mention of premarital sex increases the probability of marriage by a statistically significant 0.61 percentage points and decreases the probability of an out-of-wedlock conception by a statistically significant 0.08 percentage points (Appendix Table A.4, panels A and B, column 4). Mentions of marriages lead to a sizeable 0.13 percentage point decline in out-of-wedlock fertility during the month of the Papal visit and a statistically insignificant but negatively signed effect on such births over the longer term (Appendix Table A.4, panel B, column 2).

Since the Pope was an outspoken critic of both contraception and abortion, his visits may result in a decline in such actions, leading to an increase in fertility. Table 2 (columns 5 and 6) shows that this is indeed the case: each additional mention of abortions/contraceptives increases the probability of conception by 0.65 percentage points in the month of the visit (t-statistic = 1.8) and a further 0.71 percentage points in long run (t-statistic = 8.3). Since the average mentions per speech is only 0.08, a doubling of emphasis (0.16* β_2) would result in an increased conception probability of 0.10 and 0.11 percentage points in the immediate and long term, respectively. These

[15] Note that this is rarely mentioned in Papal speeches: one additional mention per speech represents a 20-fold increase in emphasis.

represent a 7% and 8% increase relative to the outcome mean. Further, mentions of abortion increases marriages and have a positively signed but insignificant effect on out-of-wedlock fertility (Appendix Table A.4, panels A and B, columns 5 and 6).

We further verify that the impact of Papal messages are robust to controlling for whether there was an ongoing major conflict at the time of the Pope's visit, which was one of the explicit goals of some visits and may also affect fertility behavior.[16] The effects of Papal messages remain economically and statistically significant and confirm the same patterns of results (Appendix Table A.5, Panel A).

4.3. Who Responds More to Papal Visits?

Our framework of social norms suggests that fertility behavior will change more among those who are least likely to be following Church teachings regarding fertility at the time of the visit. We first examine this directly by examining heterogeneity by religious status. We have data on the personal religious affiliation of the respondent only in seven of our 16 DHS surveys. Results in this restricted sample (Table 3, panel A, column 2) show that the Papal visit increases the long run probability of conception by 0.08 percentage points (t-statistic = 2.4) for non-Catholics, but has no statistically significant effect on Catholics ($\beta_1 + \beta_2 = 0.01$, t-statistic = .4). We supplement this analysis by analyzing two country-level measures of how far social norms might be from the Catholic ideal: the fraction of the country's population that was Catholic in 1970, and the years since the country has declared religious freedom in the constitution ("years since secularization"). These variables are available for all countries in our sample. We find very similar patterns as for the individual religious identity, namely that the fertility impact of the Pope's visit is larger in countries that have a smaller Catholic population (Table 3, panel A, columns 3 and 4). Finally, we expect that the Pope's influence in strengthening Catholic norms is only relevant in contexts where this is the prevailing social norm. Consistent with this, we find that the fertility impact of the Papal visit is smaller in countries that secularized many years ago (Table 3, panel A, columns 5-6).[17]

Based on intrinsic costs and benefits, we posit that more educated and wealthier women, who have a higher opportunity cost of time, are more likely to limit fertility by adopting practices

[16] We obtain the months and years of major conflicts across all of our countries from the Uppsala Conflict Data Programs' Database.

[17] One interpretation of this coefficient is that there is no increase in fertility following Papal visits if the country secularized more than 76 years ago.

such as contraception.[18] We find that Papal visits had significantly larger long run effects on the fertility of women who were more educated or richer; there is no discernible immediate effect (Table 3, panel B, column 2). Each additional year of education increases the probability of conceptions following the visit by 0.042 percentage points. For poorer households, proxied by those without having a car, there is a statistically significant 0.09 percentage point increase in conception probability following the visit, but their richer counterparts show a 0.25 percentage point increase ($\beta_1+\beta_2$ from column 4). Note that this pattern rules out other channels such as the Pope's visit bringing an end to conflict, or resulting in greater poverty reduction or charitable giving which would presumably affect the poor more. We further support this by re-estimating these effects while controlling for whether there was an ongoing conflict as before, confirming that the results remain unchanged (Appendix Table A.5, panels B and C).

Consistent with the idea that Papal visits encourage within-marriage fertility, we find that most of the long term fertility increase occurs on the "extensive" margin i.e. by changing the choice to have a first child. Women who had no children prior to the Papal visit experience a 0.23 percentage point immediate increase in conception probability and a 1.2 percentage point long term increase (Table 3, panel B, columns 5 and 6). For women who already had one child prior to the Papal visit, the long run effect is an insignificant -0.09 percentage points. This is also consistent with the idea that childless women are the most likely to be perceived as being inconsistent with Catholic fertility norms.[19]

5. Conclusions and Future Research

With fertility declining across almost every country in the world, economists have turned to other determinants besides traditional economic factors to understand these trends. In this paper, we explore one such factor: social norms. Specifically, we examine how fertility responds to an increase in the salience of Catholic religious' norms by exploiting the visits and speeches of Pope John Paul II across the Latin American continent. We find that the papal visits result in large and

[18] Our cross-sectional analysis shows that such individuals are indeed more likely to be using contraception: five additional years of education increases the probability of using contraception by 3 percentage points, and having a car (our proxy for wealth) increases it by 4 percentage points.

[19] We combine the estimated impact on childless women with nationwide data on the number of women aged 15-49 in the year before the Papal visit (obtained from the United Nations Population Division) and the share of women that are childless (from the DHS). This yields an estimate of 221,880 additional first births in the years following the Papal visit.

statistically significant increases in conception probability over the long term (more than two years). We find bigger fertility increases after visits where the Pope emphasizes marriage or contraception, but declines with mentions of pre-marital sex. Mentions of all three lead to increases in the probability of marriage, suggesting marital formation as an important channel in driving births. Consistent with this, increases in fertility are concentrated along the extensive margin (first births). Further, the increase in the salience of social norms have stronger impacts on individuals who are less likely to be following Church teachings at the time of the visit, such as non-Catholics, richer, and more educated women.

Overall, our results demonstrate the key role that social norms play in driving fertility behavior. This has several implications for how the changing religious landscape has contributed to the recent trend of declining fertility. Future work in this direction can include analyzing the effects of other changes in social norms such as increased secularization or changing religious denominations, and contrasting these with the effects of government policies and economic incentives.

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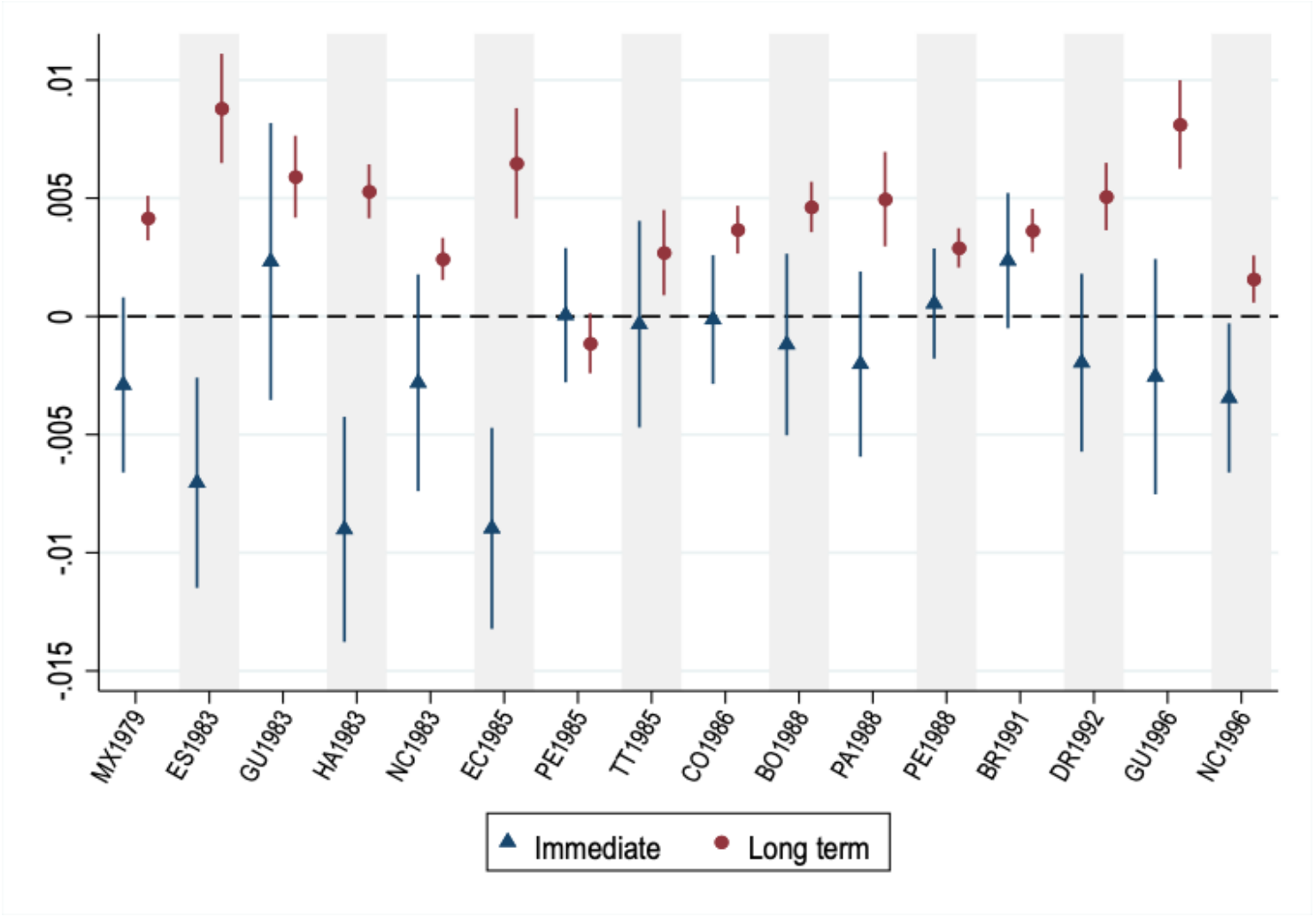
Figure 1. Fertility impact of Papal visits



Notes: Figure shows the coefficients for the immediate and long term effects of Papal visits, using the linear probability models of equations (1) and (2) respectively. The markers represent the coefficient estimates and the lines represent 95% confidence intervals. The dependent variable equals one if conception occurred in that month. Countries are ordered by the date of the visit.

Table 1: Pope John Paul II's visits to Latin America

(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)
Country	**Date of Pope visit**		**Visit code**	**DHS wave used**	**# speeches**	**# words spoken**	**Mentions of abortion, contraception or sterilization per speech**	**Mentions of marriage per speech**	**Mentions of premarital sex per speech**
Bolivia	May	1988	BO1988	1994	21	43166	0.190	0.524	0.190
Brazil	October	1991	BR1991	1996	32	48040	0.313	0.469	0.031
Colombia	July	1986	CO1986	1990	36	56934	0.000	0.306	0.056
Dominican Republic	October	1992	DR1992	1996	16	27701	0.250	0.313	0.000
Ecuador	January	1985	EC1985	1987	16	26687	0.000	0.250	0.125
El salvador	March	1983	ES1983	1985	5	4874	0.000	0.000	0.000
Guatemala	March	1983	GU1983	1987	7	8693	0.000	0.000	0.000
Guatemala	February	1996	GU1996	1998	5	4953	0.000	0.000	0.000
Haiti	March	1983	HA1983	1994	4	6403	0.000	0.250	0.000
Mexico	January	1979	MX1979	1987	26	32664	0.038	0.115	0.000
Nicaragua	March	1983	NC1983	1997-98	5	5316	0.000	0.000	0.000
Nicaragua	February	1996	NC1996	2001	4	3975	0.000	0.500	0.000
Paraguay	May	1988	PA1988	1990	13	30743	0.000	0.462	0.000
Peru	February	1985	PE1985	1991-92	15	28792	0.133	0.467	0.000
Peru	May	1988	PE1988	1991-92	13	21200	0.000	0.154	0.000
Trinidad and Tobago	February	1985	TT1985	1987	3	2826	0.333	0.000	0.333

Notes: Data includes speeches, masses, or prayers by John Paul II during the visits to these countries. Counting was done from the original speech in Spanish, except for Haiti and Trinidad & Tobago, where English-language speeches were used. Source: https://www.vatican.va/content/john-paul-ii/es.html

Table 2: Does the fertility impact vary with the content of Papal speeches?

	Mentions of marriage per speech		Mentions of premarital sex per speech		Mentions of abortion or contraception per speech	
	Immediate	Long term	Immediate	Long term	Immediate	Long term
	(1)	(2)	(3)	(4)	(5)	(6)
Papal visit (PV)	0.0651	-0.211	-0.0136	0.0952	-0.0276	0.000416
	(0.0791)	(0.0202)	(0.0472)	(0.0133)	(0.0524)	(0.0156)
PV*Mentions of marriage per speech	-0.145	0.939				
	(0.232)	(0.0523)				
PV*Mentions of premarital sex			1.075	-0.527		
			(0.530)	(0.120)		
PV*Mentions of abortion or contraception					0.648	0.709
					(0.353)	(0.0854)
Observations	10,481,928	10,481,928	10,481,928	10,481,928	10,481,928	10,481,928
# Women	133011	133011	133011	133011	133011	133011
R-squared	0.022	0.022	0.022	0.022	0.022	0.022

Notes: Robust standard errors in parentheses, clustered for each woman in the sample. Each column shows the results from the heterogeneous effects specification (3). The dependent variable equals one if conception occurred in that month. Coefficients and standard errors shown are multiplied by 100 i.e. they represent percentage point effects. "Papal visit" equals one for the month of the visit when estimating the immediate effect, and equals one for all post-visit months for the long term effect.

Table 3: Differential Effects of Papal Visits

Panel A: Differential effects by religion

	Immediate	Long term	Immediate	Long term	Immediate	Long term
	(1)	(2)	(3)	(4)	(5)	(6)
	Catholic (Individual)		Catholic (country)		# years since secularization	
Papal visit (PV)	0.391	0.0783	0.452	0.281	0.138	0.12
	(0.137)	(0.0325)	(0.308)	(0.0743)	(0.0537)	(0.0149)
PV*Catholic (individual)	-0.293	-0.0697				
	(0.151)	(0.0310)				
PV*Catholic (country)			-0.482	-0.232		
			(0.343)	(0.0828)		
PV* Years since secularization					-0.00396	-0.00156
					(0.00113)	(0.000300)
Observations	4,068,113	4,068,113	10,481,928	10,481,928	10,481,928	10,481,928
# Women	59727	59727	133011	133011	133011	133011
R-squared	0.024	0.024	0.022	0.022	0.025	0.025

Panel B: Differential effects on respondents far from the Catholic norms

	Immediate	Long term	Immediate	Long term	Immediate	Long term
	(1)	(2)	(3)	(4)	(5)	(6)
	Years of education		Economic status		Birth parity	
Papal visit (PV)	-0.0244	-0.204	0.0613	0.0862	0.232	1.171
	(0.0818)	(0.0185)	(0.0507)	(0.0145)	(0.0537)	(0.0144)
PV*Years of education	0.00793	0.0416				
	(0.00883)	(0.00179)				
PV*Has car			0.0216	0.161		
			(0.0990)	(0.0230)		
PV*One child before Pope visit					0.0176	-1.077
					(0.134)	(0.0231)
PV*Two or more children before Pope visit					-0.463	-2.034
					(0.0871)	(0.0189)
Observations	10,460,504	10,460,504	8,604,970	8,604,970	10,481,928	10,481,928
# Women	132607	132607	115156	115156	133011	133011
R-squared	0.022	0.022	0.023	0.023	0.022	0.023

Notes: Robust standard errors in parentheses, clustered for each woman in the sample. Each column shows the results from the heterogeneous effects specification (3). The dependent variable equals one if conception occurred in that month. Coefficients and standard errors shown are multiplied by 100 i.e. they represent percentage point effects. Catholic (individual) equals one if the respondent identifies as a Catholic in the DHS surveys; this variable is missing for several countries (see Table A.2). Catholic (country) is the fraction of the country's population that was recorded as Catholic in 1970, according to the World Christian Database. Date of secularization is defined as the year in which the constitution was changed to explicitly include freedom of religion.

Religion and Demography: Papal Influences on Fertility

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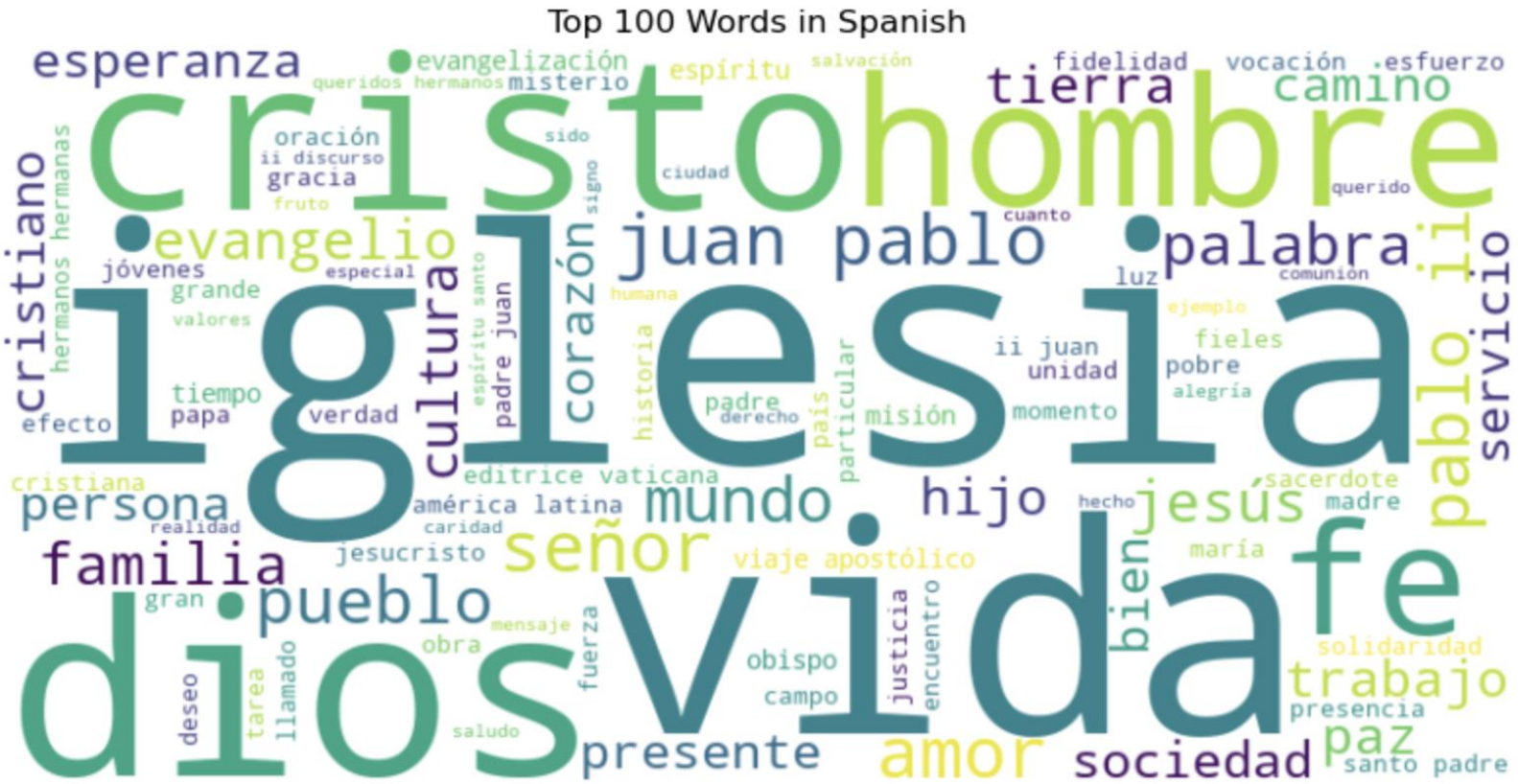
Appendix A: Additional Figures and Tables

Figure A.1. Map of Latin America

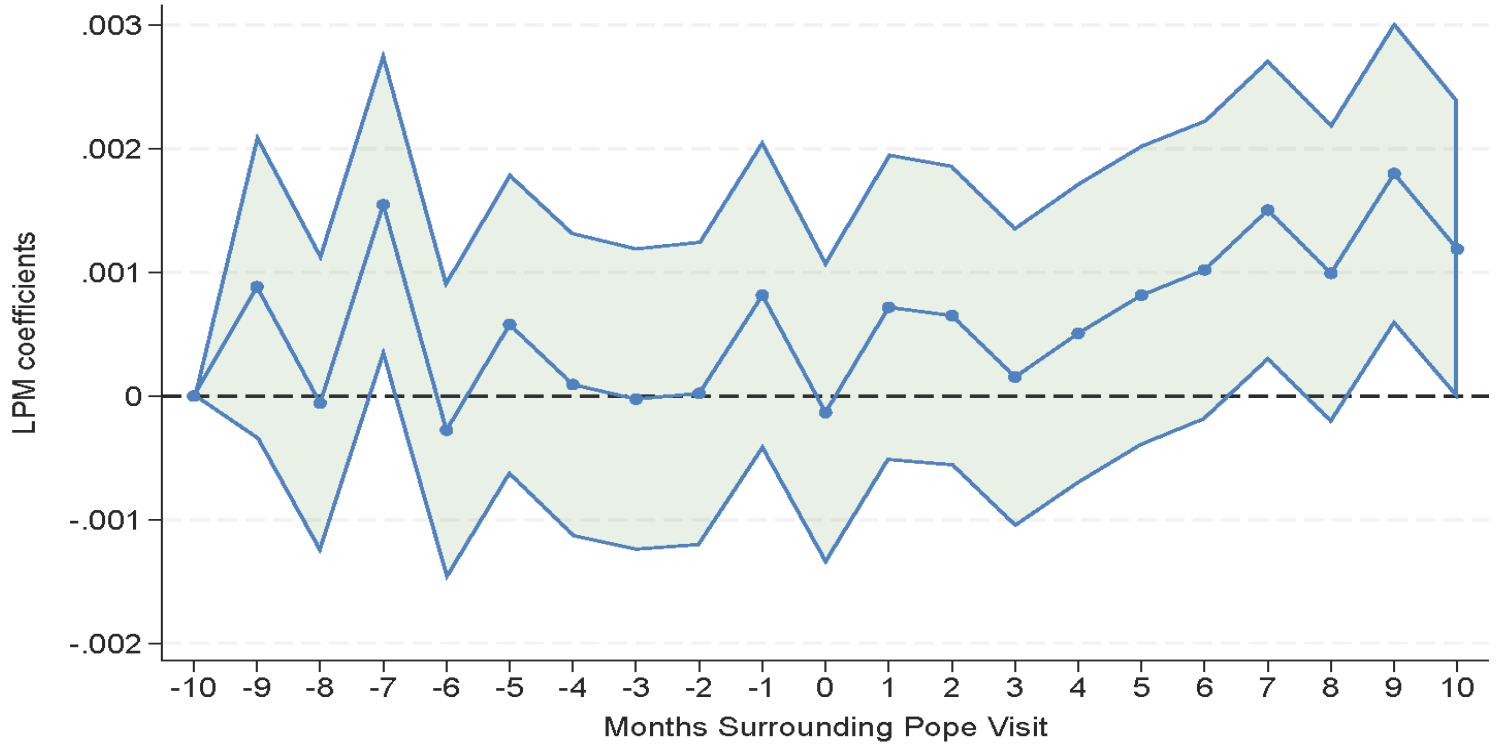
Notes: Shaded countries are those included in our analysis.

Figure A.2. Text Analysis of Papal Speeches



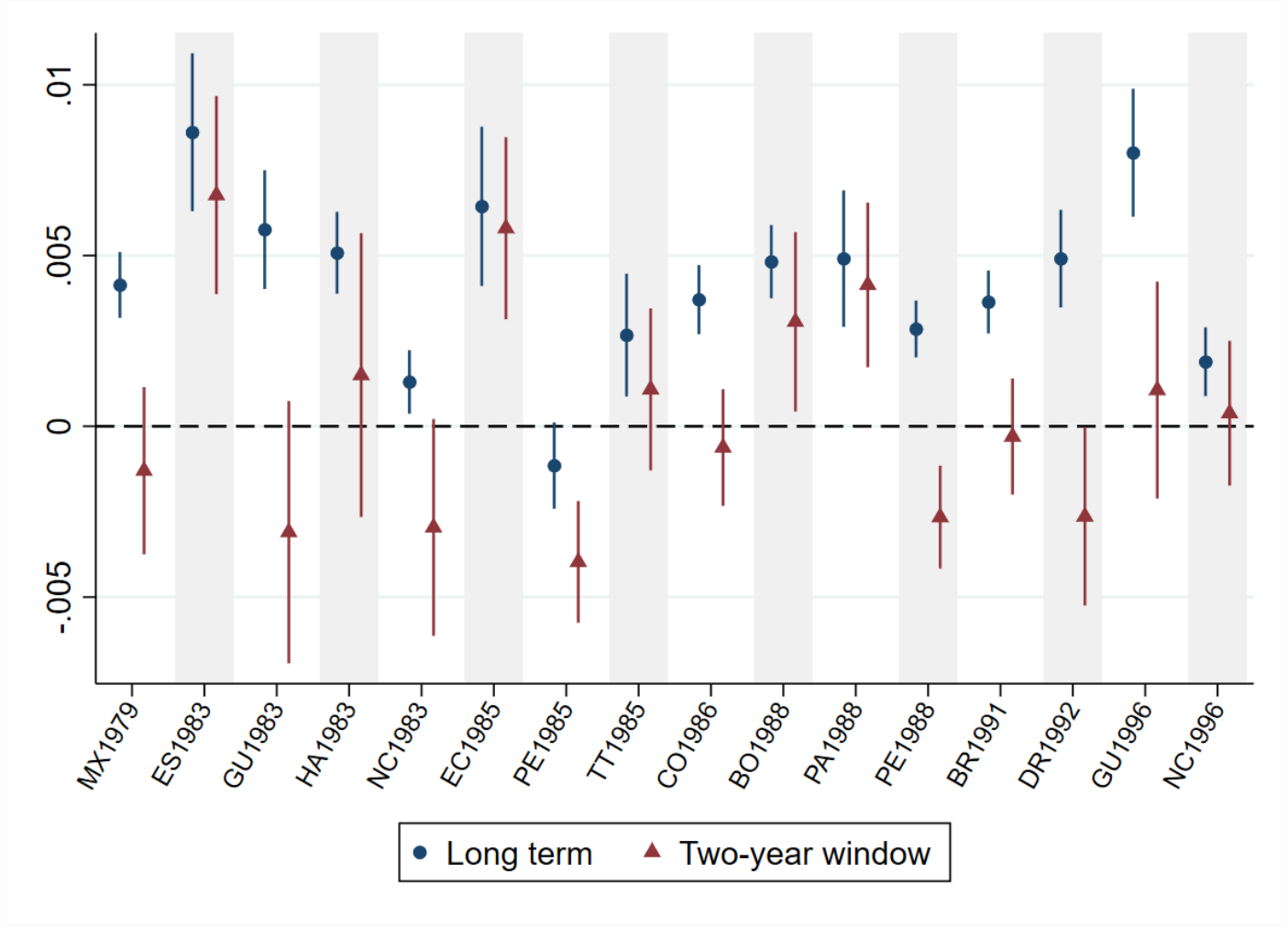
Notes: This word cloud was generated using the top 100 most frequent words in the Pope's Spanish language speeches, excluding stop words like prepositions, articles etc. Analysis excludes speeches in Brazil, Haiti and Trinidad & Tobago. The ten most frequent words are, in order: church (iglesia), life (vida), God (dios), Christ (cristo), man (hombre), faith (fe), Juan Pablo (John Paul), love (amor), lord (señor), people (pueblo).

Figure A.3. Dynamic Effects of Pope Visits on Fertility Outcomes



Notes: The dots represent the coefficient estimates and the shaded areas represent 95% confidence intervals. The x-axis shows months since the Pope's visit (0 indicates the month of the visit, +1 the month after, -1 the month before and so on), and the y-axis shows the additional probability of conception in that month controlling for year and month fixed effects. The regression is based on specification (1), where we pool data from all the countries in our sample, and replace the pope visit indicator with indicators for 10 lags and leads surrounding the papal visit. We bin 11 months before and onwards and 11 months after and onwards into their own separate indicators. The indictor for 10 months prior is omitted, making each coefficient a comparison of the probability of conception in a given month surrounding the visit and the probability 10 months prior to the visit.

Figure A.4. Comparing Long Term Fertility Effects to Two-Year Effects



Notes: Figure shows the coefficients for the long term and two-year effects of Papal visits, using the linear probability models of equation (2). The markers represent the coefficient estimates and the lines represent 95% confidence intervals. The dependent variable equals one if conception occurred in that month. Countries are ordered by the date of the visit.

Table A.1. Content Analysis of Pope John Paul II's Speeches in Latin America

Visit dates -->	Bolivia	Brazil	Colombia	DR	Ecuador	El Salvador	Guatemala		Haiti	Mexico	Nicaragua		Paraguay	Peru		T & T
	1988	1991	1986	1992	1985	1983	1983	1996	1983	1979	1983	1996	1988	1985	1988	1985
# of speeches	21	32	36	16	16	5	7	5	4	26	5	4	13	15	13	3
Total Word Coun	43166	48040	56934	27701	26687	4874	8693	4953	6403	32664	5316	3975	30743	28792	21200	2826
# of mentions of specific keywords																
Abortion, contraceptives, sterilization	4	10	0	4	0	0	0	0	0	1	0	0	0	2	0	1
Premarital sex	4	1	2	0	2	0	0	0	0	0	0	0	0	0	0	1
Marriage	11	15	11	5	4	0	0	0	1	3	0	2	6	7	2	0
Divorce	1	1	0	1	0	0	1	0	0	2	1	0	0	1	1	1
Children	101	48	113	44	51	12	15	8	6	57	8	14	40	33	18	1
Family	42	82	67	16	36	2	6	0	5	38	6	11	20	14	3	2
Charity	19	39	35	4	13	3	8	0	2	8	2	0	15	13	18	0
Education	23	9	17	7	11	0	6	0	2	7	13	1	7	7	3	0
Poverty	19	43	16	12	8	2	0	0	2	4	0	1	4	7	8	0
Faith	90	130	180	94	50	10	42	17	19	65	22	6	88	56	75	2

Notes: Data includes speeches, masses or prayers by John Paul II during the visits to these countries. Counting was done from the original speech in Spanish, except for Haiti and Trinidad & Tobago, where English-language speeches were used.

Source: https://www.vatican.va/content/john-paul-ii/es.html

Table A.2. Summary Statistics

Country	Pope visit	DHS wave used	demographic transition	Year of secularization	Characteristics of DHS sample						Outcome variables (woman-month observations)			
					Has TV or Radio	Years of education	Has a car	Catholic	#children prior to Pope visit	# of Women	#observations	Conception	Out-of-wedlock birth	Marriage
Bolivia	1988	1994	1969	2009	0.88	6.70	-	-	2.0	8555	835,933	0.0160	0.0010	0.009
Brazil	1991	1996	1957	1989	0.92	6.38	0.261	0.78	1.7	11097	821,555	0.0109	0.0009	0.008
Colombia	1986	1990	1971	1991	0.93	7.32	0.159	-	1.5	8240	594922	0.0091	0.0007	0.007
Dominican Republic	1992	1996	1954	1924	0.85	7.64	0.124	-	1.9	7127	458,046	0.0147	0.0003	0.012
Ecuador	1985	1987	1957	1906	0.89	7.09	0.172	-	2.2	4410	187,887	0.0112	0.0005	0.008
El Salvador	1983	1985	1968	1883	0.83	4.73	0.107	-	0.9	4503	191011	0.0133	0.0005	0.011
Guatemala	1983	1987	1971	1985	0.72	3.07	0.099	-	2.0	5097	377,305	0.0207	0.0005	0.012
Guatemala	1996	1998	1971	1985	0.83	3.56	0.121	0.52	2.6	5697	317,581	0.0166	0.0005	0.011
Haiti	1983	1994	1983	1987	0.51	3.60	0.051	0.57	0.9	5353	727,692	0.0156	0.0003	0.010
Mexico	1979	1987	1971	1857	-	6.60	-	-	1.5	9300	1,041,025	0.0153	0.0005	0.009
Nicaragua	1983	1997-98	1973	1973	0.84	5.72	0.088	-	0.9	13631	1,785,038	0.0194	0.0004	0.014
Nicaragua	1996	2001	1973	1973	0.88	5.86	0.085	-	2.0	12421	942,648	0.0164	0.0005	0.012
Paraguay	1988	1990	1950	1992	0.91	6.44	0.137	0.96	2.3	5686	250,904	0.0125	0.0012	0.008
Peru	1985	1991-92	1962	1979	0.88	7.48	0.124	0.87	1.6	12699	670,834	0.0158	0.0008	0.009
Peru	1988	1991-92	1962	1979	0.88	7.46	0.128	0.87	2.0	15502	1,085,362	0.0114	0.0006	0.007
Trinidad and Tobago	1985	1987	1961	1962	0.98	7.84	0.541	0.27	1.8	3693	194,185	0.0085	0.0001	0.011

Table A.3. Does exposure to Papal visits matter for fertility?

	No Interaction	No Interaction	Pope visited local region		Have TV or radio	
	Immediate	Long term	Immediate	Long term	Immediate	Long term
	(1)	(2)	(1)	(2)	(3)	(4)
Papal visit (PV)	0.0254	0.0753	-0.0152	0.0411	-0.0644	0.125
	(0.0426)	(0.0125)	(0.0616)	(0.0156)	(0.148)	(0.0307)
PV*Area visited by Pope			0.0871	0.0685		
			(0.0836)	(0.0179)		
PV*Has TV or radio					0.140	-0.0266
					(0.155)	(0.0301)
Observations	10,481,928	10,481,928	10,481,928	10,481,928	9,408,966	9,408,966
# Women	133011	133011	133011	133011	123263	123263
R-squared	0.022	0.022	0.022	0.022	0.022	0.022

Notes: Robust standard errors in parentheses, clustered for each woman in the sample. Each column shows the results from the heterogeneous effects specification (3). The dependent variable equals one if conception occurred in that month. Coefficients and standard errors shown are multiplied by 100 i.e. they represent percentage point effects. "Papal visit" equals one for the month of the visit when estimating the immediate effect, and equals one for all post-visit months for the long term effect.

Table A.4. Impact of Papal Visits on Marriage and Out-of-Wedlock Births

	Immediate	Long term	Immediate	Long term	Immediate	Long term
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Dependent variable is (first) marriage						
Papal visit (PV)	0.131	-0.117	0.105	0.0211	0.109	-0.0528
	(0.104)	(0.0335)	(0.0597)	(0.0225)	(0.0662)	(0.0251)
PV*Mentions of marriage per speech	-0.173	0.535				
	(0.305)	(0.0916)				
PV*Mentions of premarital sex			-0.680	0.607		
			(0.782)	(0.235)		
PV*Mentions of abortion/contraception per speech					-0.316	0.965
					(0.444)	(0.148)
Observations	3,915,724	3,915,724	3,915,724	3,915,724	3,915,724	3,915,724
# Women	79609	79609	79609	79609	79609	79609
R-squared	0.056	0.056	0.056	0.056	0.056	0.056
Panel B: Dependent variable is out-of-wedlock birth						
Papal visit (PV)	0.0344	0.0123	-0.00121	0.0118	-0.00255	0.00566
	(0.0215)	(0.00584)	(0.0138)	(0.00410)	(0.0150)	(0.00472)
PV*Mentions of marriage per speech	-0.134	-0.0113				
	(0.0606)	(0.0156)				
PV*Mentions of premarital sex			-0.0334	-0.0771		
			(0.138)	(0.0356)		
PV*Mentions of abortion/contraception per speech					0.00158	0.0306
					(0.106)	(0.0267)
Observations	10,481,928	10,481,928	10,481,928	10,481,928	10,481,928	10,481,928
# Women	133011	133011	133011	133011	133011	133011
R-squared	0.016	0.016	0.016	0.016	0.016	0.016

Notes: Robust standard errors in parentheses, clustered for each woman in the sample. Each column shows the results from the heterogeneous effects specification (3). The dependent variable in panel A is an indicator equal to one if a woman enters a (first) marriage in the month. The dependent variable in Panel B is an indicator equal to 1 if an out of wedlock conception (i.e., a conception outside of marriage) occurred in that month. Coefficients and standard errors shown are multiplied by 100 i.e. they represent percentage point effects.

Table A.5. Robustness Controlling for Ongoing Conflicts

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Papal Speeches	Immediate	Long term	Immediate	Long term	Immediate	Long term
Papal visit (PV)	0.0641	-0.224	-0.0146	0.1	-0.0289	0.00156
	(0.0791)	(0.0203)	(0.0472)	(0.0134)	(0.0524)	(0.0156)
PV*Mentions of marriage per speech	-0.145	1.032				
	(0.232)	(0.0545)				
PV*Mentions of premarital sex			1.077	-0.519		
			(0.530)	(0.120)		
PV*Mentions of abortion or contraception					0.652	0.776
					(0.353)	(0.0870)
Observations	10,481,928	10,481,928	10,481,928	10,481,928	10,481,928	10,481,928
# Women	133011	133011	133011	133011	133011	133011
R-squared	0.022	0.022	0.022	0.022	0.022	0.022
Panel B: Differential effects by religio	Immediate	Long term	Immediate	Long term	Immediate	Long term
Papal visit (PV)	0.413	0.0909	0.448	0.282	0.137	0.129
	(0.137)	(0.0326)	(0.308)	(0.0743)	(0.0537)	(0.0150)
PV*Catholic (individual)	-0.303	-0.0748				
	(0.151)	(0.0310)				
PV*Catholic (country)			-0.478	-0.227		
			(0.343)	(0.0828)		
PV* Years since secularization					-0.00394	-0.00162
					(0.00113)	(0.000299)
Observations	4,068,113	4,068,113	10,481,928	10,481,928	10,481,928	10,481,928
# Women	59727	59727	133011	133011	133011	133011
R-squared	0.024	0.024	0.022	0.022	0.025	0.025

	Immediate	Long term	Immediate	Long term	Immediate	Long term
Panel C: Differential effects on respondents far from the Catholic norms						
Papal visit (PV)	-0.0262	-0.199	0.0603	0.0955	0.231	1.176
	(0.0818)	(0.0186)	(0.0507)	(0.0147)	(0.0537)	(0.0146)
PV*Years of education	0.00805	0.0417				
	(0.00883)	(0.00179)				
PV*Has car			0.0218	0.163		
			(0.0990)	(0.0230)		
PV*One child before Pope visit					0.0178	-1.077
					(0.134)	(0.0231)
PV*Two or more children before Pope visit					-0.464	-2.034
					(0.0871)	(0.0189)
Observations	10,460,504	10,460,504	8,604,970	8,604,970	10,481,928	10,481,928
# Women	132607	132607	115156	115156	133011	133011
R-squared	0.022	0.022	0.023	0.023	0.022	0.023

Notes: Robust standard errors in parentheses, clustered for each woman in the sample. These tables replicate Tables 2 and 3, but add a control for an indicator equal to one in a month-year in which there is an ongoing conflict. Data on the timing of conflicts are taken from the Uppsala Conflict Data Program. Panel A reruns Table 2, and Panels B and C rerun Table 3. The dependent variable equals one if conception occurred in that month. Coefficients and standard errors shown are multiplied by 100 i.e. they represent percentage point effects. Catholic (individual) equals one if the respondent identifies as a Catholic in the DHS surveys; this variable is missing for several countries (see Table A.2). Catholic (country) is the fraction of the country's population that was recorded as Catholic in 1970, according to the World Christian Database. Date of secularization is defined as the year in which the constitution was changed to explicitly include freedom of religion.

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Appendix B: Model of Social Norms and Fertility Choice

We present a simple model based on Spolaore and Wacziarg (2022) and Akerlof (1997). Consider a household i choosing their level of fertility, n_i. Let F_n denote the maximum level of fertility that would occur with full adherence to Catholic social norms that prohibit modern birth control.[1] The household then chooses the level of fertility to maximize the following indirect utility:

$$V_i = b_i n_i - \frac{c_i}{2} n_i^2 - \sigma(F_n - n_i) \quad (1)$$

where $0 \leq n_i \leq F_n$. The first two terms capture, in the language of Akerlof (1997), the "intrinsic" benefit of fertility b_i and the opportunity cost c_i of forgone consumption from having children. These are individual specific, representing the individual's costs and preferences. The final term captures the impact of social norms, namely, a utility cost from deviating from the prescribed societal norm. $\sigma \geq 0$, not indexed by i, captures the cost an individual incurs for choosing fertility below the culturally prescribed level. In our setting, σ is interpreted as the marginal costs from social stigma incurred from deviating from Catholic Church proscriptions of fertility control in a Catholic-majority country. This is a cost borne by anyone residing in a majority Catholic country, regardless of their religious beliefs and intrinsic valuations. We view the Papal visit as increasing this social stigma cost σ.[2] Thus, the utility loss associated with an increase in the salience of social norms is increasing in the size of the deviation between the optimal choice of fertility and the prescribed norm:

$$\frac{\partial V_i}{\partial \sigma} = -(F_n - n_i^*) \quad (2)$$

Maximizing (1), the demand for children is given by:

[1] Generally, this could refer to any culturally prescribed level of fertility that households are expected to achieve given their social norm.

[2] Spolaore and Wacziarg (2022) offer two interpretations of σ, the moral/social costs from deviating from the norm, their preferred interpretation, or the costs of obtaining/learning about contraception. For instance, abortion or contraception could become difficult to access following the Papal visit from the supply side.

$$n_i^* = min\left\{ \frac{b_i + \sigma}{c_i} \ , F_n \right\}$$

First, consider the subset of households would choose the socially prescribed level of fertility based on their intrinsic costs and benefits alone for all $\sigma \geq 0$, or for whom $n_i^* = F_n \leq \frac{b}{c}$. These households are inframarginal and would not alter their fertility choice in response to increases in σ. In other words, $\frac{\partial V_i}{\partial \sigma} = 0$.

On the other hand, for the subset of households for which fertility is below F_n given the current level of σ, $n_i^* = \frac{b_i+\sigma}{c_i} < F_n$. These are households that live in a society that has a particular norm over fertility choice, but their intrinsic benefit-to-cost ratio is sufficiently low that they do not chose the prescribed level of fertility given the current costs from deviating from the norm. These households are the ones who face the largest incentives to respond to changes in σ.[3]

Overall, this framework suggests that the fertility response to the papal visit should be stronger for those who are less likely to be adhering to Catholic norms on fertility at the time of the visit, or those whose intrinsic benefit-to-cost ratios for children are low. This can include women who are non-Catholics, or who face higher opportunity costs of their time, or women who are more likely to be using modern contraceptives at the time of the visit.

[3] There are also those whose intrinsic utility would lead them to choose a level of fertility below their desired level of fertility, $\frac{b_i}{c_i} < F_n$, however the current levels of σ are such that $\frac{b_i+\sigma}{c_i} \geq F_n = n_i^*$. These households would be "switchers" in the case of lowering costs of social norms, however these households are not relevant in our setting here, where the focus is the increase in the salience of norms.

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Appendix C: Views of Pope John Paul II

We present some extracts from the speeches and writings of Pope John Paul II to illustrate his stance towards fertility-related issues such as marriage, pre-marital sex, contraception and abortion.

On marriage:

"The union between man and woman has been sanctified by Christ in the sacrament of *Matrimony*. In it, spouses are indissolubly united to form a community of life and love (cf. *Gaudium et Spes* , n. 48) and to give rise to a family. Children are born in their womb, the fruit of parental love, who fulfill God's will and thus collaborate with his creative power. This sacrament gives you the grace necessary to increase love, to remain faithful and to educate your children to be honest men and good Christians. Conscious of the dignity of marriage and the family, you must reject those modes of behavior that are contrary to the teachings of Christ and to true conjugal happiness." (Meeting with indigenous people during visit to Paraguay, 1988)

"The reciprocal gift of the spouses, both physically and spiritually, thereby acquires its true, great, and indestructible importance—even from a human point of view—as the total commitment of man and woman for life, until death; and from this totality also arise the demands of responsible parenthood, "which, oriented towards engendering a human person, by its nature surpasses the purely biological order and touches a series of personal values, for whose harmonious growth the lasting and concordant contribution of the parents is necessary" (Ibid.). Therefore, this donation is only possible within marriage, in the community of life and love willed by God." (Homily during visit to Ecuador, January 1985)

"The conjugal union is a covenant modeled on the communion of love between God and His people in the history of salvation, with a bond of fidelity from which its nature, strength, and

indissolubility derive; moreover, it is modeled on the spousal union between Christ and His Church, in the sacramental economy of the New Testament; so that the spouses, belonging to each other, are its true image, its eloquent 'sign,' its real representation…Thus, the most precious gift of children is the highest expression of this reciprocal donation, founded on the donation of God to humanity and of Christ to the Church (Familiaris Consortio, 14)." (Visit to Ecuador, January 1985)

<u>On pre-marital sexual relations:</u>

"In this situation, some of you may be tempted to flee from your responsibility: into the illusory worlds of alcohol and drugs, into fleeting sexual relationships without any commitment to marriage or family, into indifference, cynicism, and even violence. Be on your guard against the fraud of a world that wants to exploit or misdirect your energetic and anxious search for happiness and direction." ("Peace and young people walk together," Message of His Holiness John Paul II for the celebration of the 18th World Day of Peace, January 1, 1985.)

"In particular, young people should be instructed in a timely and opportune manner, preferably within the family itself, about the dignity, value, and role of conjugal love, so that, formed in the preservation of chastity, when they reach the appropriate age, they can transition from an honorable courtship to marriage' (Ibid., 49). This formation, which should be personal, will primarily be the responsibility of parents (Congregation for Catholic Education, Educational Guidance on Human Love, nn 48 and 84)." (Speech during visit to Bolivia, May 1988)

"There lies the allure of easy and quick enrichment, through ways that are contrary to the law and Christian morality; the temptation of escape that can sink you into the alienation of drugs, alcoholism, sex, and other regrettable vices…Do you want to be faithful to Jesus and His doctrine in your personal life, in the respect for your body, and in your friendships and courtships?" (Meeting with the Youth, Homily during visit to Colombia, July 1986)

<u>On contraception and abortion:</u>

"When couples, by means of recourse to contraception, separate these two meanings that God the Creator has inscribed in the being of man and woman and in the dynamism of their sexual

communion, they act as ‘arbiters’ of the Divine plan and they ‘manipulate’ and degrade human sexuality - and with it themselves and their married partner - by altering its value of ‘total’ self-giving. Thus, the innate language that expresses the total reciprocal self-giving of husband and wife is overlaid, through contraception, by an objectively contradictory language, namely, that of not giving oneself totally to the other. This leads not only to a positive refusal to be open to life but also to a falsification of the inner truth of conjugal love, which is called upon to give itself in personal totality.” (*Familiaris Consortio* encyclical, 1981)

“Families suffer from such evils as conjugal infidelity and divorce, while the very life of the unborn is snuffed out by the unspeakable crime of abortion. Always remember that respect for the sacredness of life is a guarantee of stability for the human community. No society can survive - no nation can last - unless all human life is honored and protected.” (Homily during visit to Trinidad and Tobago, February 1985)

“Contraception is a falsification of conjugal love that turns the gift of participating in God's creative action into a mere convergence of petty selfishness (*Familiaris Consortio*, 30 and 32). And how can we not repeat once again in this circumstance that if obstacles cannot be placed in the way of life, even less can the unborn be eliminated with impunity, as is done with abortion?” (Homily during visit to Dominican Republic, October 1992)

“Never fall into the regrettable temptation of thinking that the solution to problems lies in the elimination of new lives through prohibited methods of birth control, or through sterilization or abortion. Do not yield to the moral blackmail of those who condition healthcare and material aid on illicit plans of birth limitation.” (Visit to Bolivia, May 1988)

“The family: Make every effort to have a family pastoral care. Attend to this priority field with the certainty that evangelization in the future depends largely on the ‘domestic Church.’ It is the school of love, of the knowledge of God, of respect for life, for human dignity. This pastoral care is all the more important as the family is the target of many threats. Think of the campaigns favorable to divorce, the use of contraceptive practices, abortion, which destroy society.” (Speech by Pope John Paul II at the third general conference of the Latin American Episcopate during his visit to Mexico, January 1979).

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Appendix D: Proportional Hazards Model

As an alternative specification, and also to check consistency with the earlier Bassi and Rasul (2017) paper, we estimate an extension of the proportional hazards framework to a discrete time setting, namely the complementary log-log hazard model. This models the hazard of woman *i* conceiving in month-year *t,* conditional on not conceiving up to then, as a function of a baseline hazard rate and covariates $\boldsymbol{Z_{it}}$ as follows:

$$\text{(D.1)} \qquad Log[-log(1-(t, \lambda(t-\boldsymbol{Z_{it}}))] = \theta_0(t) + \boldsymbol{Z_{it}}\beta$$

In equation (D.1), the baseline hazard $\theta_0(t)$ is the complementary log-log transformation of the baseline hazard ($=log[-log(1-\lambda_0(t))]$); the latter is modeled by including dummies for the number of months since the last birth. $\boldsymbol{Z_{it}}$ includes a dummy variable for the month of the Pope's visit (our main variable of interest), time-invariant characteristics of the woman (education, religion, rural residence, proxies for economic status such as car ownership), time-varying characteristics of the woman (number of previous children, age and age-squared) and woman-invariant characteristics to capture seasonal or macroeconomic effects (month of birth and year of birth dummies).

The signs and statistical significance of the hazard model estimates are very similar to immediate effects estimated by the LPM model: most of the coefficients are statistically significant, except for three negative and significant coefficients for El Salvador, Haiti and Ecuadro (Appendix Figure D.1, panel A). Note that our estimated coefficient for the Brazil 1991 visit (labeled BR1991) is extremely close to the estimated coefficient in the Bassi and Rasul (2017) paper (labeled "BR1991(B&R)" in the graph), though our estimated coefficient is significant only at the 10% level.[1] Only two other country-visits show a positively-signed coefficient (Guatemala 1983 and Peru 1988), though these are not statistically significant.

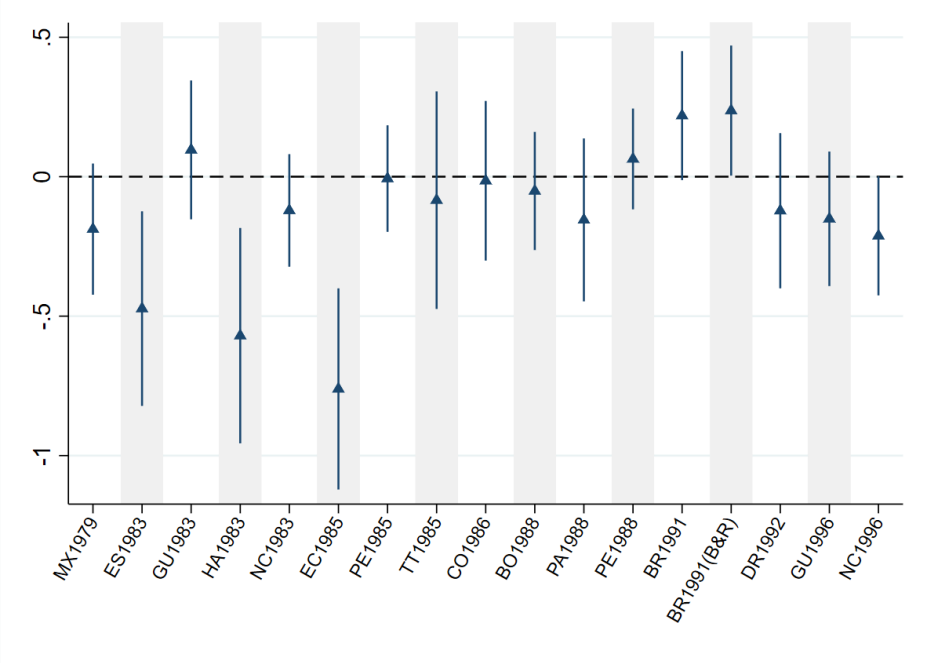
[1] Due to data sharing restrictions of the DHS, actual replication data is not available for the B&R paper. We downloaded the DHS data and applied their sample restrictions and methodology and obtained very close results e.g. our coefficient is 0.216 compared to their coefficient of 0.237. Despite following their paper closely, and

Interpreting the magnitude of the complementary log-log coefficients is similar to the interpretation of Cox proportional hazards coefficients. For instance, the hazard model coefficient of 0.216 for Brazil implies a 24% increase over the baseline hazard rate (exp(0.216)-1); since the average probability of conception in any given month is 0.0108, this translates to a 0.26 percentage point increase in the conception probability during the month of the Pope's visit. This is quite close to the 0.24 percentage point increase estimated by the LPM. This closeness holds for all the countries in our sample (Appendix Figure D.1, panel B): the correlation between the estimated effect sizes from the LPM and hazard models is 0.97.

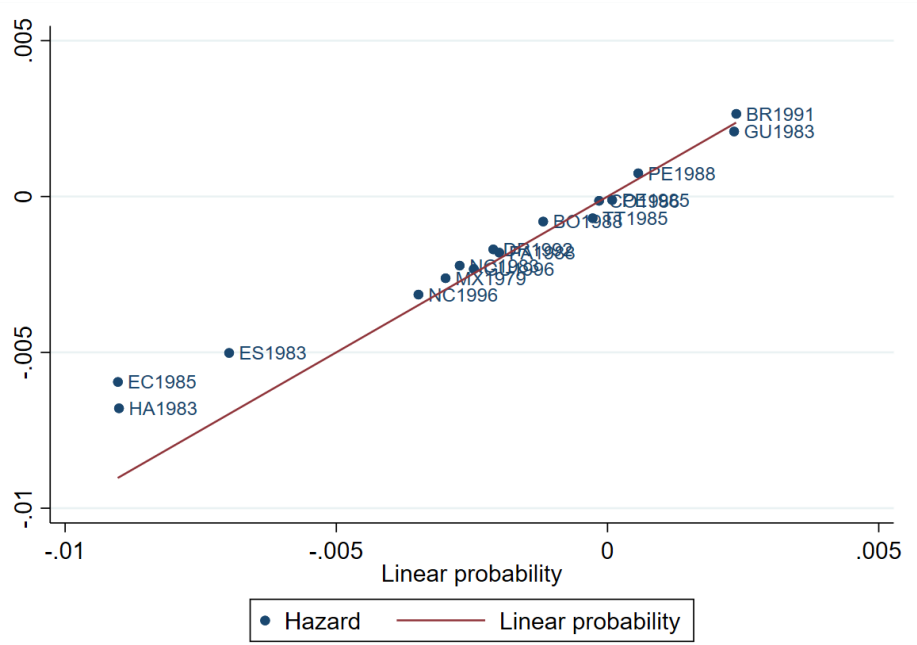
communicating with the authors directly, we were not able to obtain the exact number of observations or the same regression coefficient.

Figure D.1. Comparing the Magnitudes of the Hazard Model and Linear Probability Model Effects

A. Hazard Model Coefficients



B. Comparison with LPM Coefficients



Notes: Figure A shows the results of estimating a discrete porportional hazard model instead of the linear probability model in (1). The dots represent the coefficient estimates and the lines represent 95% confidence intervals. BR1991(B&R) represents the estimate taken from Bassi and Rasul (2017) in Brazil. In Figure B, the x-axis graphs the change in conception probability during the month of the Pope's visit, obtained from the linear probability model (equation (1)). The y-axis graphs the increases in the probability of conception during the month of the Pope's visit, obtained from the hazard model coefficients (Figure A above). For a hazard model coefficient β, the percentage increase in the probability is obtained as [exp(β) - 1]. This is converted to percentage points by using the average probability of conception (Appendix Table A.2).